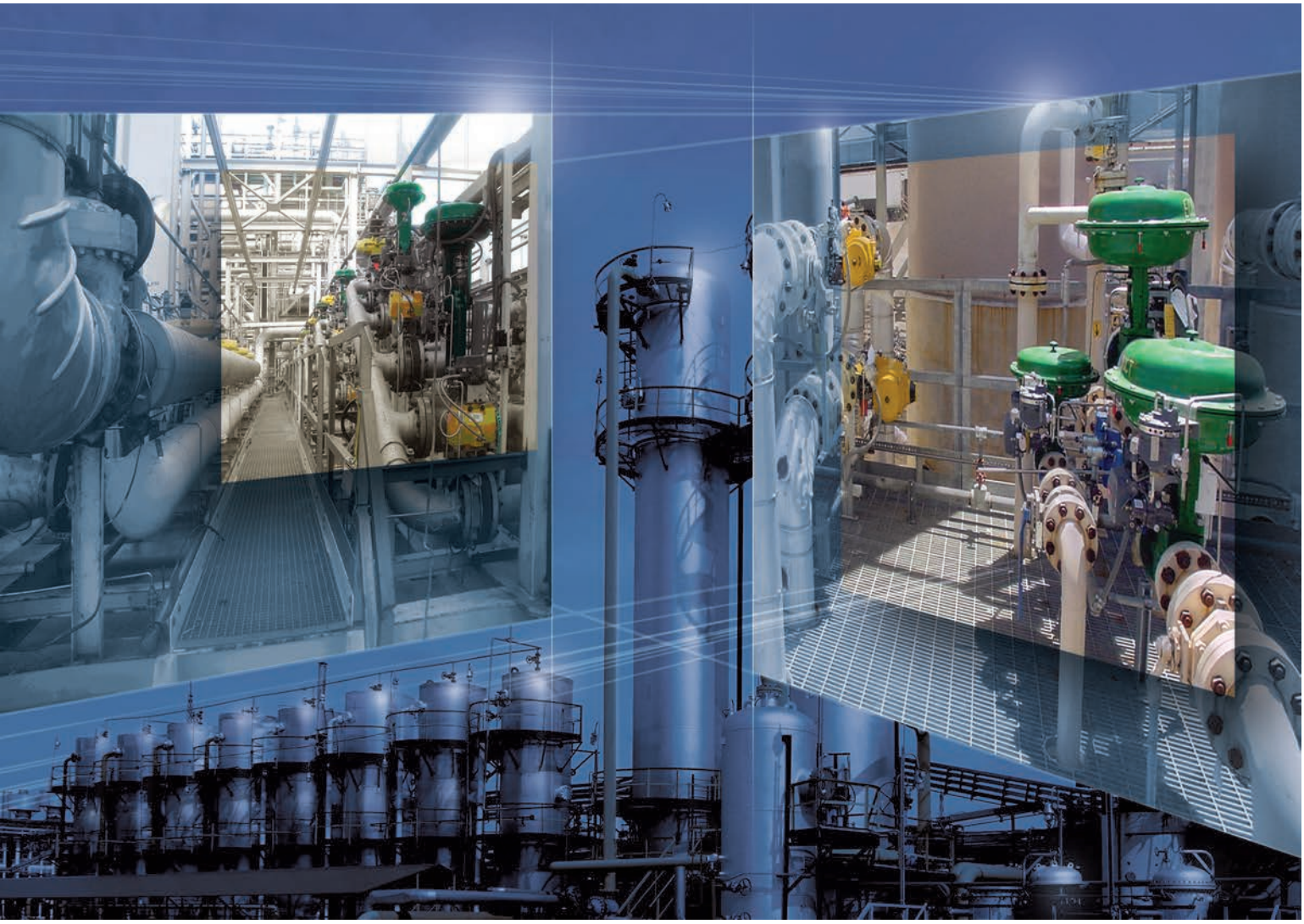
For Nonstop Operation of High-Cycle Applications

Use Fisher® Control Valve Assemblies



FISHER®

EMERSON™
Process Management

For Nonstop Operation of High-Cycle Operations, Use Fisher Control Valve Assemblies

High-cycle applications such as pressure swing adsorption and molecular sieve adsorption are very abusive on control valve assemblies. Stroking frequency exceeds 60,000 cycles per year and tight shutoff to Class V or Class VI is required to maintain industrial gas purity and efficiency.

Proper selection of control valve assemblies is imperative. Fisher® control valve assemblies typically consist of the control valve, an actuator, and a digital valve controller.

Incorporating Fisher control valve assemblies from Emerson into your high-cycle applications can have significant benefits.

Improve Reliability – End users have increased turnaround schedules to five years using Fisher control valve assemblies. Their long-term reliability is demonstrated by rigorous testing to more than 1,000,000 cycles and they are licensor accepted.

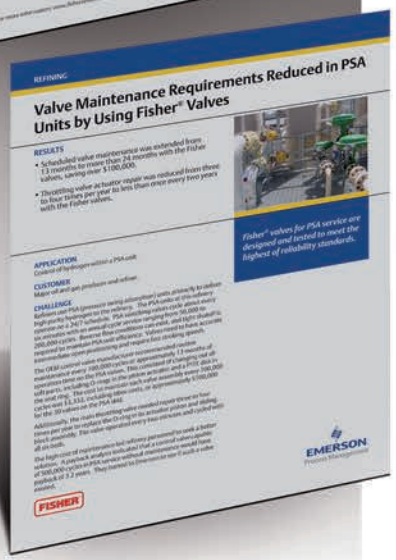
Improve Uptime – When you use Fisher control valve assemblies you can expect to see improvements in uptime, as they are engineered to meet high-cycle application requirements. The durability of their mechanical moving parts and soft parts is the key to long periods of operation.

Improve Purity – Higher quantities of on-specification industrial gas can be produced using Fisher control valve assemblies that maintain tight shutoff throughout their lifetime.

In addition to providing top quality, expertly engineered control valve assemblies, Emerson offers application assistance, responsive replacement parts service, and training.

Read how Emerson's Fisher control valve assemblies have helped customers with their high-cycle applications. These proven results flyers provide solid, quantifiable results from real customers.

Revamping Control Valves and Adding FIELDVUE Instruments Saved a Refinery and its PSA Unit $2,000,000 Per Year



Control Valve Maintenance Requirements Reduced in PSA Units by Using Fisher Valves

Applications Discussion

Pressure Swing Adsorption (PSA)

PSA is a process that involves separating impurities from a feedgas mixture to produce a single product gas such as hydrogen, oxygen, or nitrogen.

Feedgas cycles through fixed-bed adsorbers, which are surrounded by control valves that use forward and reverse flow to rapidly switch gases between parallel vessels. Within the fixed-bed adsorber, impurities are removed from the product gas at high pressure and then rejected as the system pressure "swings" to a lower pressure. The ability to completely adsorb impurities allows the production of high purity (99.99%) end product.

The challenge of PSA is that control valve assemblies are expected to cycle as often as every thirty seconds and provide tight, bi-directional shutoff. Common failures of control valve assemblies in PSA units include:

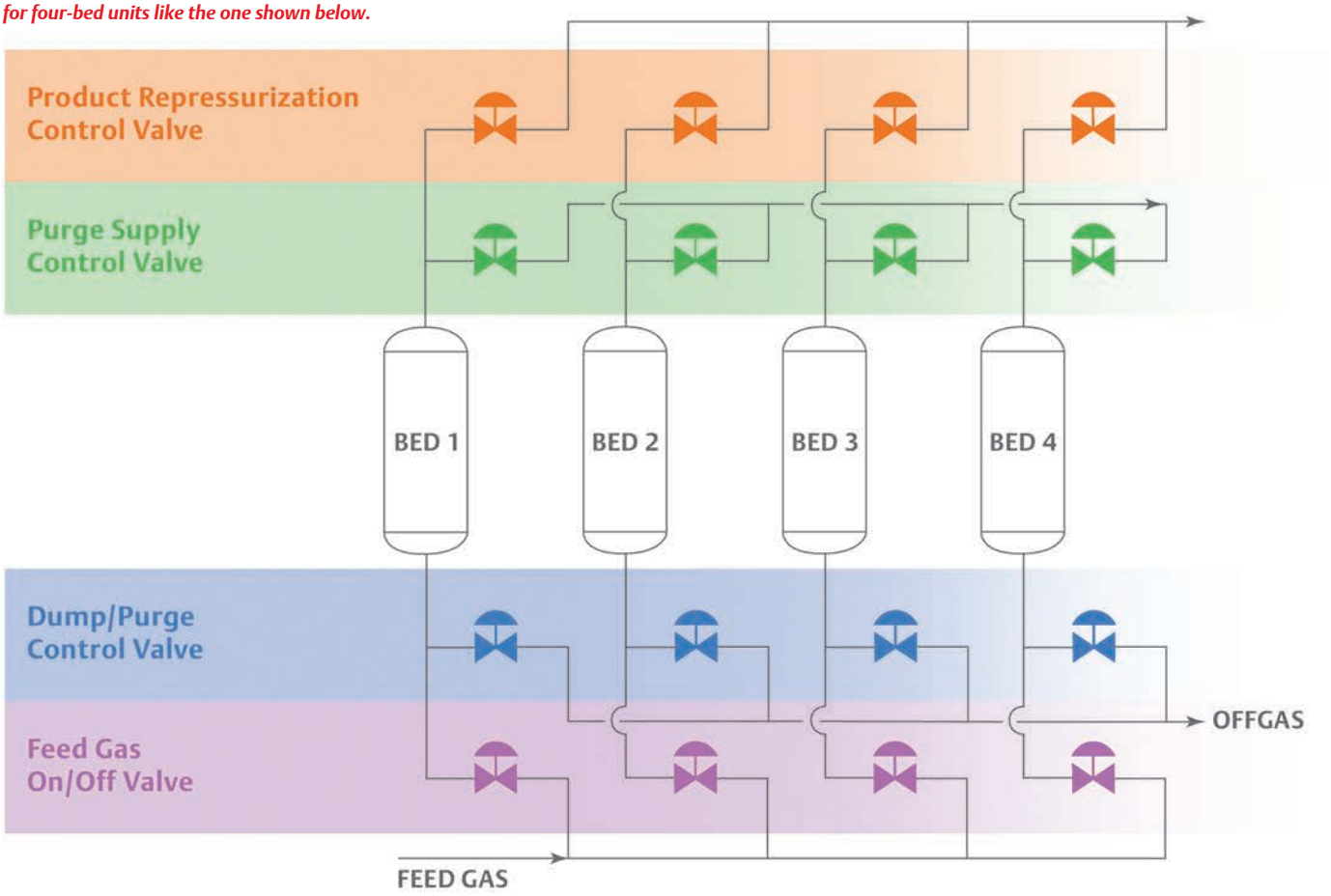
- Stem or shaft breakage due to deficient pinning design
- Poor valve-actuator-positioner linkages leading to multiple mechanical failures in a high-cycle environment
- Loss of shutoff

Your PSA units can achieve longer lifecycles with Fisher control valve assemblies. Fisher control valve assemblies for PSA applications are tested to one million cycles to meet Emerson's high-cycle quality standard.

The high-performance, linkage-less feedback system in FIELDVUE™ digital valve controllers has no wearing parts so cycle life is maximized. The feedback system eliminates physical contact between the valve stem and the digital valve controller. It is completely non-contact and does not rely on linkages, eliminating the most common control valve failure mode. Scan the QR code to learn more about the linkage-less feedback system in the DVC6200 instrument.

PSA Unit

The PSA unit is a severe service application for control valve assemblies. High cycling action and tight shutoff is required. Annual cycle service exceeds 60,000 cycles for four-bed units like the one shown below.



Molecular Sieve Adsorption

With the competitive environment in the ethanol industry constantly increasing, now is the time to focus on improving overall plant efficiency and reliability. Regardless of plant scale, the molecular sieve adsorption application presents a significant opportunity for such improvements.

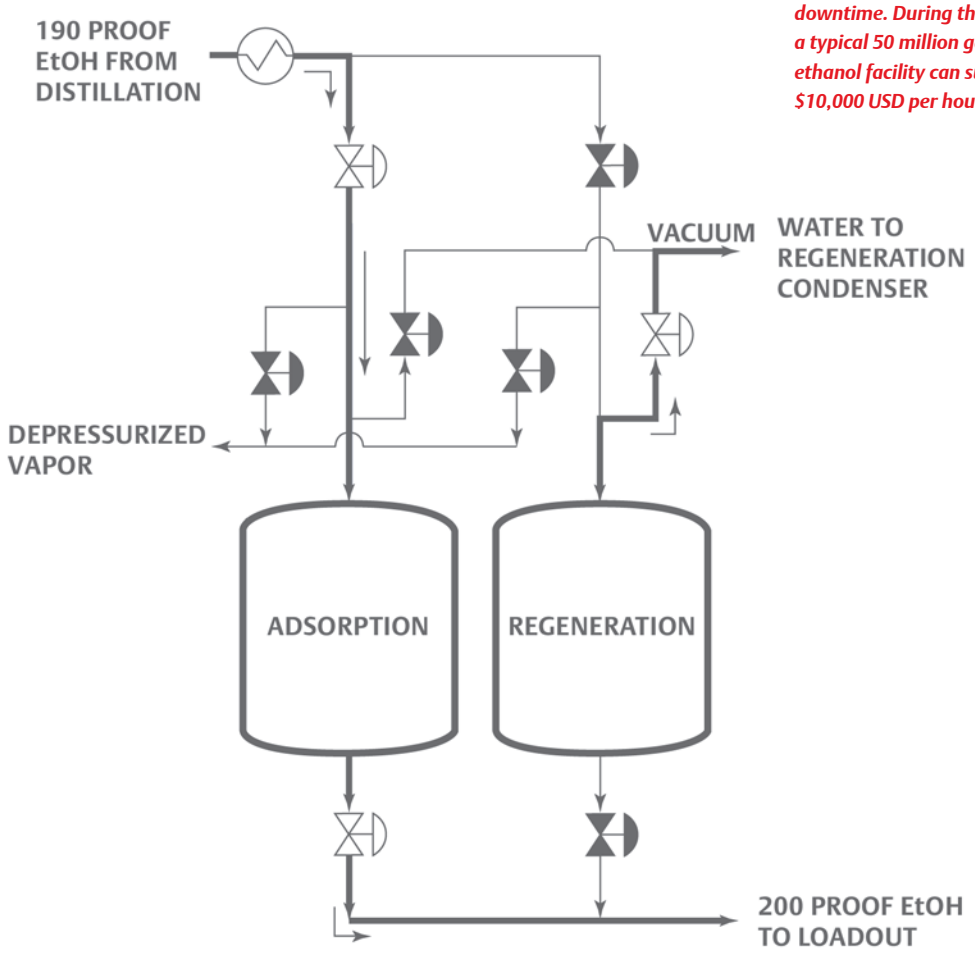
In surveying ethanol producers from around the world, some of the most commonly reported maintenance problems related to the molecular sieve adsorption unit include:

- Selection of oversized butterfly valves leading to poor control and reduced cycle life
- Accelerated bearing wear, often seen after only a few months
- Poor valve-actuator-positioner linkages leading to multiple mechanical failures in a high-cycle environment
- Poor performance from low-quality valve positioners in both the adsorption and regeneration cycles

Continued enhancement of this essential component of the ethanol process is critical to achieving plant output and revenue targets. Fisher control valve assemblies for molecular sieve adsorption applications are tested to one million cycles to meet Emerson's high-cycle quality standard.

Molecular Sieve Adsorption

Improper selection of control valve assemblies can lead to unscheduled downtime. During this downtime, a typical 50 million gallon-per-year ethanol facility can suffer over $10,000 USD per hour in lost revenue.



Improve Reliability

Licensor Accepted

Emerson offers a breadth of tested and proven-reliable Fisher control valve assemblies to help extend the lifecycle of high-cycle applications and maintain purity. Fisher control valve assemblies are accepted by several of the world's leading licensors for use in their high-cycle applications because they were validated through lab testing and field trials.

Fisher GX Control Valve Assembly

- Testing Minimum: 1,000,000 Cycles
- Fisher GX actuator
- Valve Body Size Range:
  NPS ½, ¾, 1, 1½, 2, 3, 4, and 6
  DN 15, 20, 25, 40, 50, 80, 100, and 150
- Pressure Rating:
  CL150, 300 per ASME B16.34
  PN 10, 16, 25, 40 per EN 1092-1
- Explosion-proof, intrinsically safe, non-incendive applications with integral 4–20 mA position feedback:
  FIELDVUE DVC6200 instrument
- Intrinsically safe, non-incendive applications with integral 4–20 mA position feedback:
  FIELDVUE DVC2000 instrument

Fisher easy-e™ Control Valve Assembly

- Testing Minimum: 1,000,000 Cycles
- Fisher 657 or 667 actuator
- Valve Body Size Range:
  NPS ½—36
  DN 25 to 300x200
- Pressure Rating:
  To ANSI Class 900
  To DIN PN 160
- Explosion-proof, intrinsically safe, non-incendive applications with integral 4–20 mA position feedback:
  FIELDVUE DVC6200 instrument
- Intrinsically safe, non-incendive applications with integral 4–20 mA position feedback:
  FIELDVUE DVC2000 instrument

Fisher 8580 Control Valve Assembly

- Testing Minimum: 1,000,000 Cycles
- Fisher 2052 actuator
- Valve Body Size Range:
  NPS 2, 3, 4, 6, 8, 10, and 12
  DN 50, 80, 100, 150, 200, 250, and 300
- Pressure Rating:
  CL150, 300 per ASME B16.34
- Explosion-proof, intrinsically safe, non-incendive applications with integral 4–20 mA position feedback:
  FIELDVUE DVC6200 instrument
- Intrinsically safe, non-incendive applications with integral 4–20 mA position feedback:
  FIELDVUE DVC2000 instrument

Fisher A31A or A81 Control Valve Assembly

- Testing Minimum: 1,000,000 Cycles
- Rack and pinion actuator
- A31A Valve Body Size Range:
  NPS 14, 16, 18, 20, and 24
  DN 350, 400, 450, 500, and 600
- A81 Valve Body Size Range:
  NPS 2, 3, 4, 6, 8, 10, and 12
  DN 50, 80, 100, 150, 200, 250, and 300
- Pressure Rating:
  CL150, 300 per ASME B16.34
- Explosion-proof applications with integral 4-20mA position feedback:
  TopWorx™ DXP valve controller
- Explosion-proof, intrinsically safe, non-incendive applications with integral 4–20 mA position feedback:
  FIELDVUE DVC6200 instrument
- Intrinsically safe, non-incendive applications with integral 4–20 mA position feedback:
  FIELDVUE DVC2000 instrument

Validated Through Testing

The Emerson PSA testing facility was designed to represent the PSA process as accurately as possible. A large volume tank (see ①) provides process pressure in high capacity to all of the control valve assemblies currently being tested. Instrument air is filtered and dried using desiccant, and is then regulated to the appropriate pressure for each control valve assembly.

Each control valve assembly being tested is comprised of standard option parts, including valve seats, packing, actuator springs, and diaphragms. Each control valve assembly is controlled with a Fisher FIELDVUE digital valve controller. During the course of testing, no parts are changed—all data is gathered with the original seats, springs, and diaphragms as received from the factory.

Using Emerson's DeltaV™ workstation (see ②) and switching solenoids, in conjunction with the Fisher FIELDVUE digital valve controller, the test valve is subjected to full bi-directional pressure swings. This combination allows cycles (see ③) to accumulate very quickly—up to 25,000 cycles per week—while being faithful to the process conditions.

The valve plug is pressurized to 350 psi then stroked from 0–100–0% travel, subjecting the valve to a 350 psi pressure drop as the air vents to atmosphere. Actuator stroke time is controlled so that the 0–100% and 100–0% strokes occur in under two seconds. In addition to counting cycles, pressure taps have been installed allowing for seat leak testing as cycles accumulate.

Each control valve assembly is inspected several times per week for general operation. This checklist includes things like smooth operation, evidence of wear, and any audible changes.

The use of Fisher FIELDVUE digital valve controllers allows for monitoring of diagnostic and performance data such as friction, spring rate, and bench set. This information gives a detailed picture of what is happening inside the valve as cycle counts reach and exceed 1,000,000.

Improve Purity

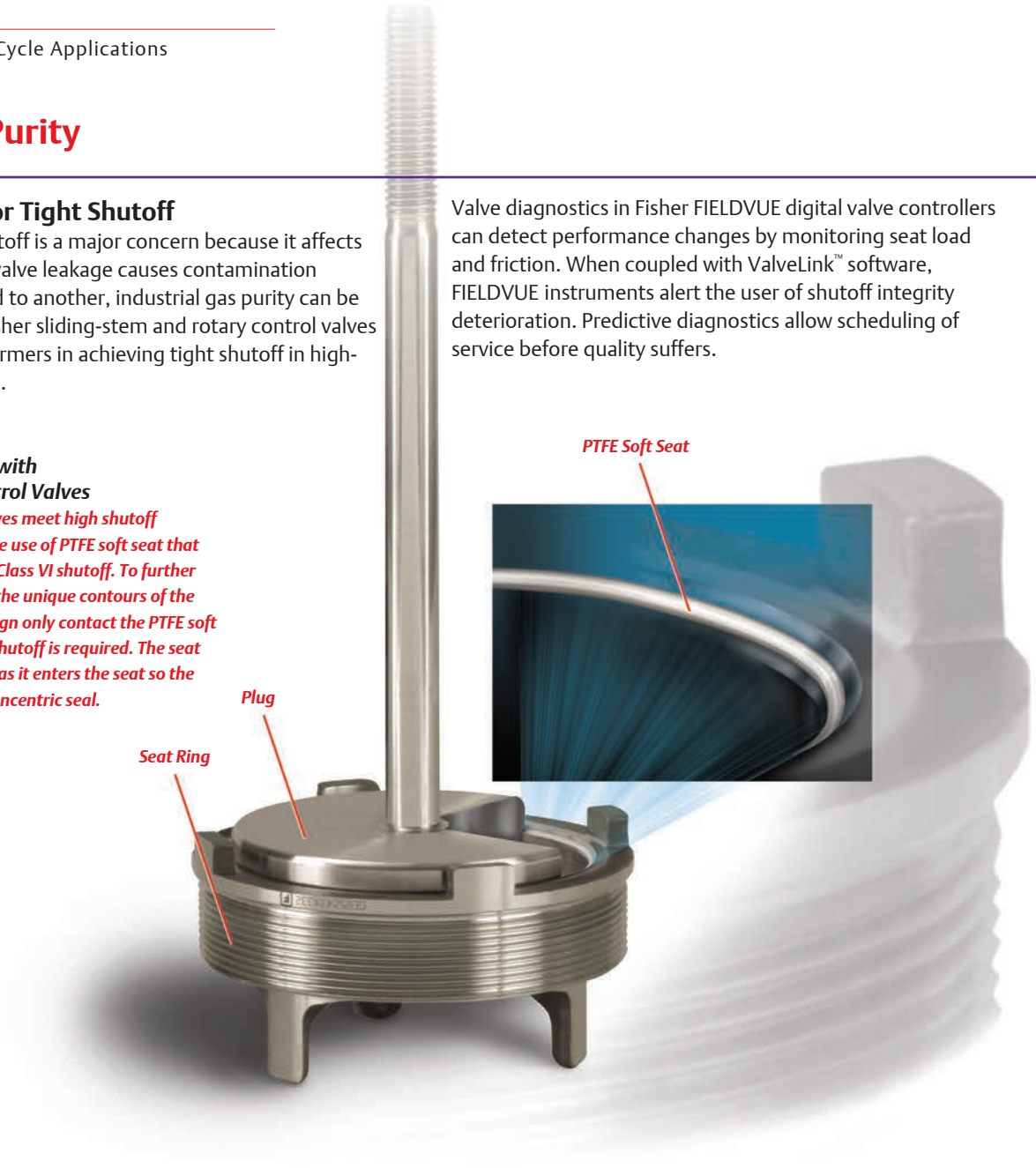
Engineered for Tight Shutoff

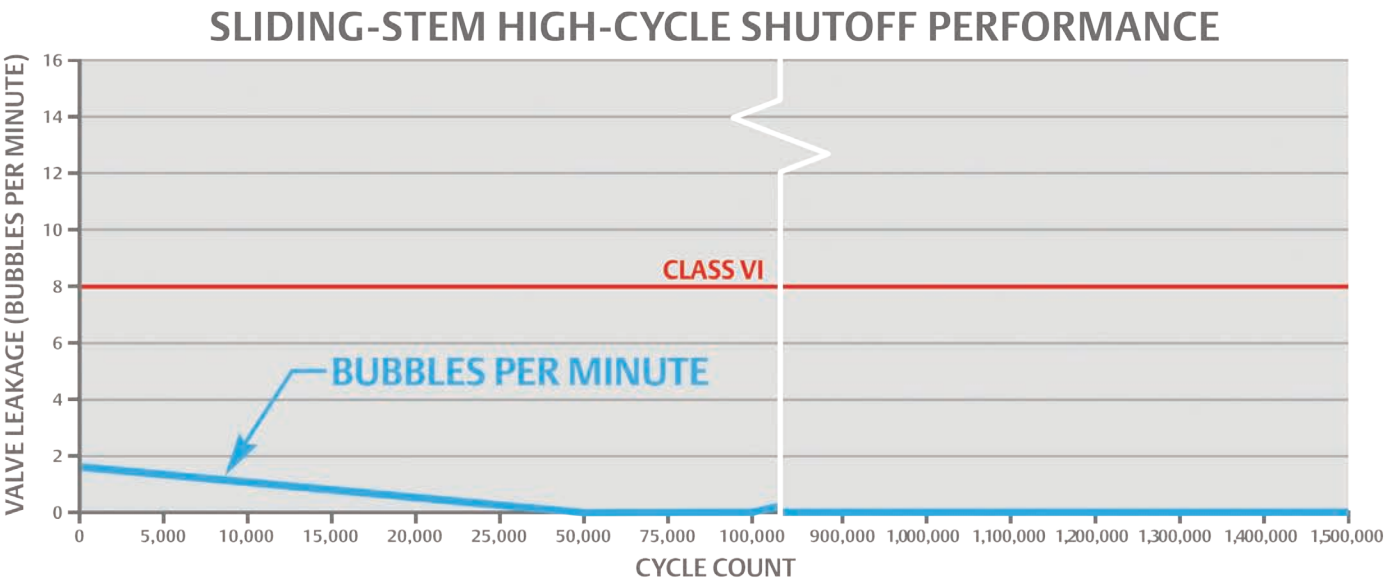
Control valve shutoff is a major concern because it affects purity. If control valve leakage causes contamination from one PSA bed to another, industrial gas purity can be compromised. Fisher sliding-stem and rotary control valves are premier performers in achieving tight shutoff in high-cycle applications.

Valve diagnostics in Fisher FIELDVUE digital valve controllers can detect performance changes by monitoring seat load and friction. When coupled with ValveLink™ software, FIELDVUE instruments alert the user of shutoff integrity deterioration. Predictive diagnostics allow scheduling of service before quality suffers.

Excellent Shutoff with Sliding-Stem Control Valves

Fisher GX control valves meet high shutoff requirements with the use of PTFE soft seat that enables long-lasting Class VI shutoff. To further assure tight shutoff, the unique contours of the unbalanced plug design only contact the PTFE soft seat at the moment shutoff is required. The seat ring centers the plug as it enters the seat so the valve establishes a concentric seal.

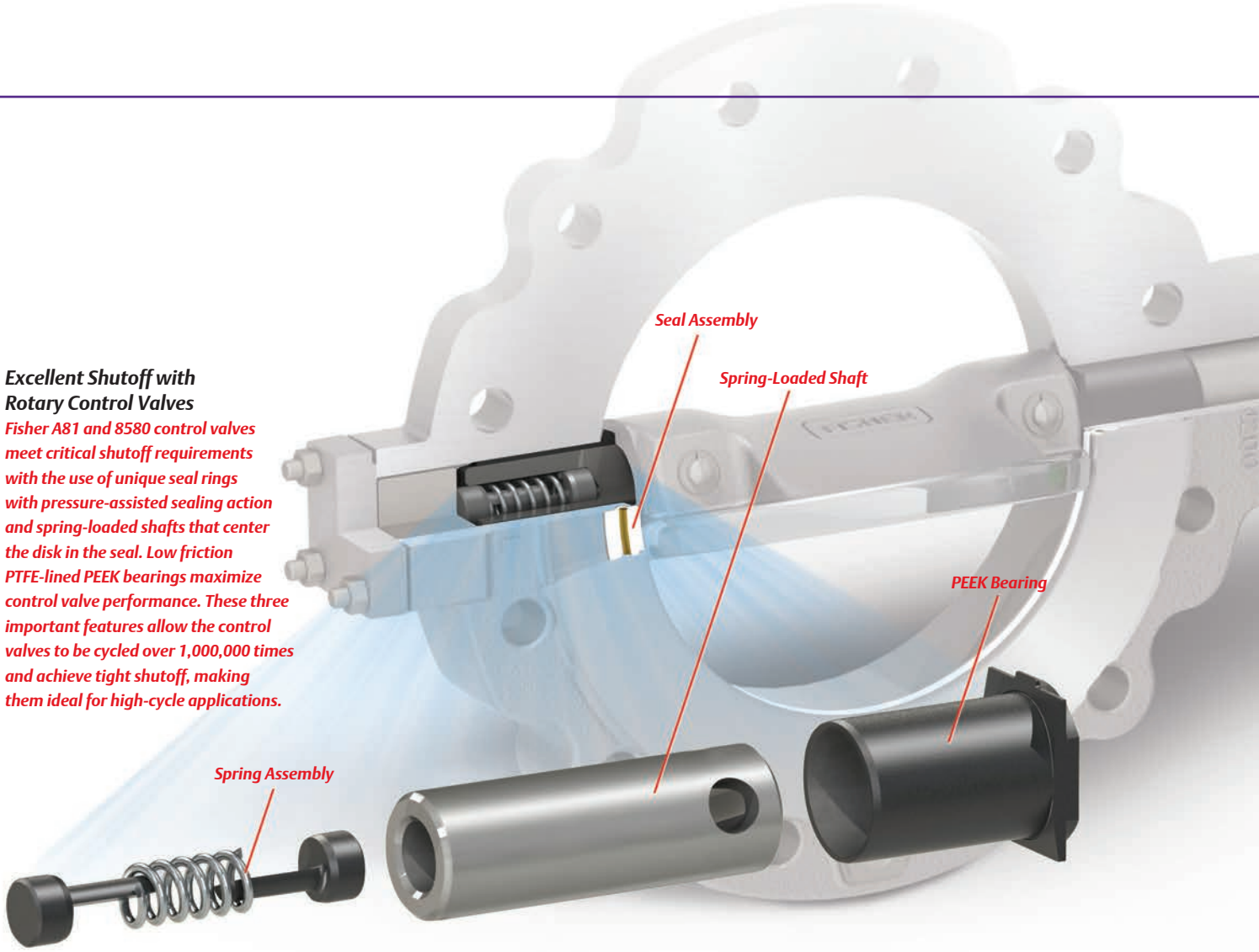


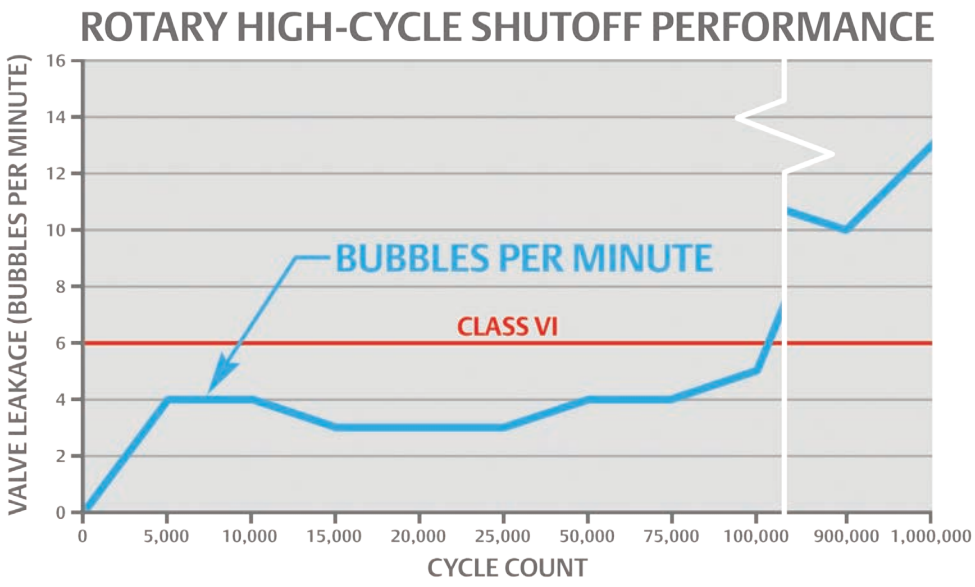


The Fisher sliding-stem control valve achieves acceptable Class VI shutoff throughout the life of the testing.

Excellent Shutoff with Rotary Control Valves

Fisher A81 and 8580 control valves meet critical shutoff requirements with the use of unique seal rings with pressure-assisted sealing action and spring-loaded shafts that center the disk in the seal. Low friction PTFE-lined PEEK bearings maximize control valve performance. These three important features allow the control valves to be cycled over 1,000,000 times and achieve tight shutoff, making them ideal for high-cycle applications.





The Fisher rotary control valve achieves acceptable Class VI shutoff throughout the life of the testing.

Improve Uptime with Sliding-Stem Control Valve Assemblies

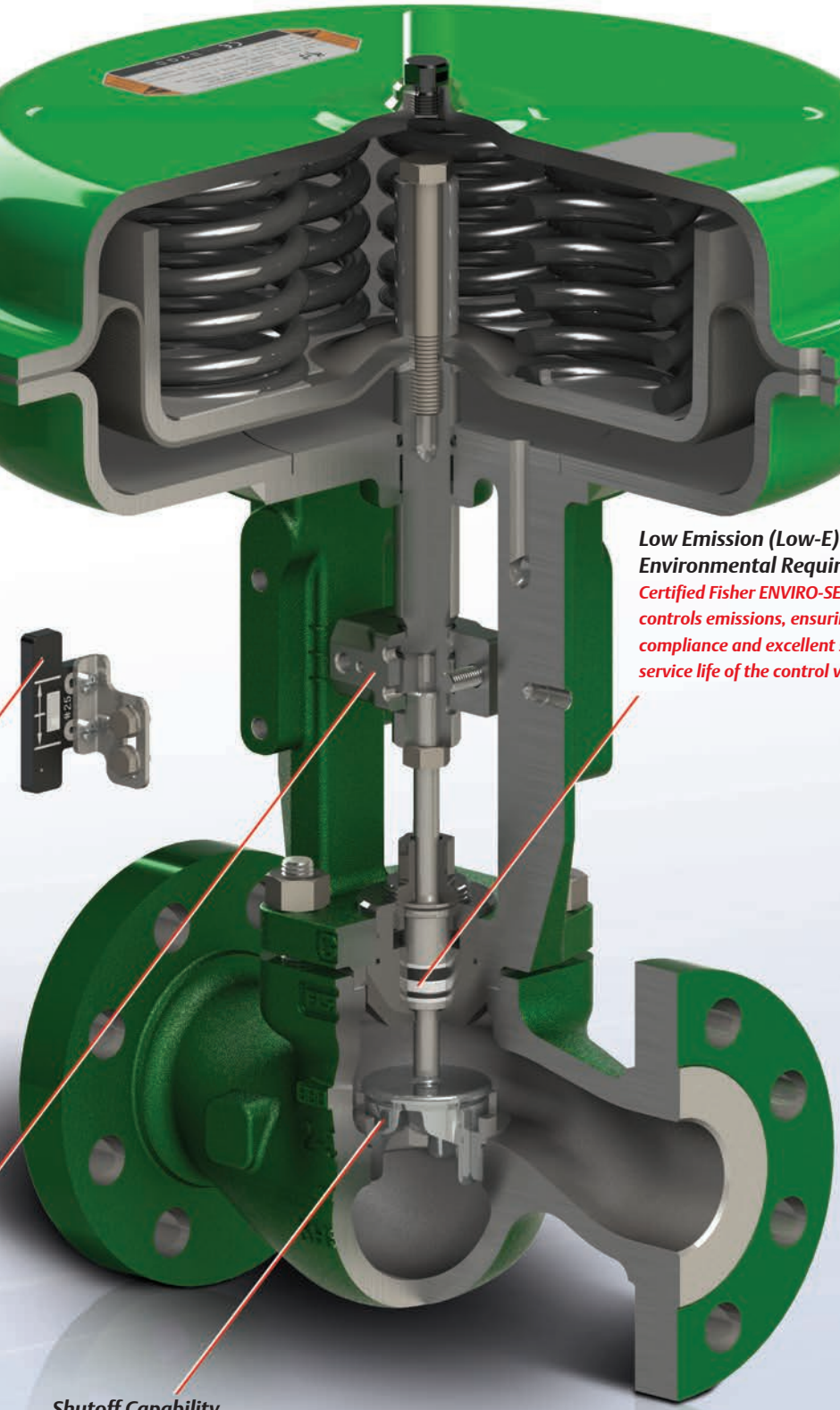
- **Reliable Actuator Performance -** Special GX actuator diaphragm material helps reduce common problems such as air oxidation, thermal aging, low temperature embrittlement, and loss of retention. Unlike a piston actuator, the GX spring-and-diaphragm actuator does not have a large diameter sliding seal that is subject to wear. The double-sided diaphragm within the actuator helps eliminate mechancial wear-induced failure.
- **Fast Stroking Speed -** When your high-cycle applications require adjustable cycle times, Fisher control valve assemblies deliver with fast actuator stroking speeds and tight process control.
- **Precise Valve Positioning -** Linkage-less, non-contact FIELDVUE digital valve controllers are paired with Fisher control valves to achieve precise positioning accuracy and fast response to process changes. FIELDVUE digital valve controllers offer integral 4-20 mA position feedback for explosion-proof or non-explosion-proof applications.

Zero Lost Motion
With no linkage to wear, loosen, corrode, or vibrate, FIELDVUE digital valve controllers can handle harsh environments and nonstop cycling. A magnet array and Hall Effect sensor are used to detect valve position.

On-Line, In-Service Diagnostics
When coupled with ValveLink software, FIELDVUE digital valve controllers give advanced notice of performance issues and provide recommended actions.

Pushbutton Calibration and Versatility
Configure, calibrate, and tune the FIELDVUE DVC2000 digital valve controller using its local user interface with four pushbuttons. Users can select their language of choice, which allows for global standardization.

Enhanced Stem Alignment
The stem connector eliminates axial load on the packing system, improves the stem seal, and increases packing life.



Low Emission (Low-E) Packing Meets Environmental Requirements

Certified Fisher ENVIRO-SEAL™ packing system controls emissions, ensuring environmental compliance and excellent sealing over the extended service life of the control valve.

Shutoff Capability

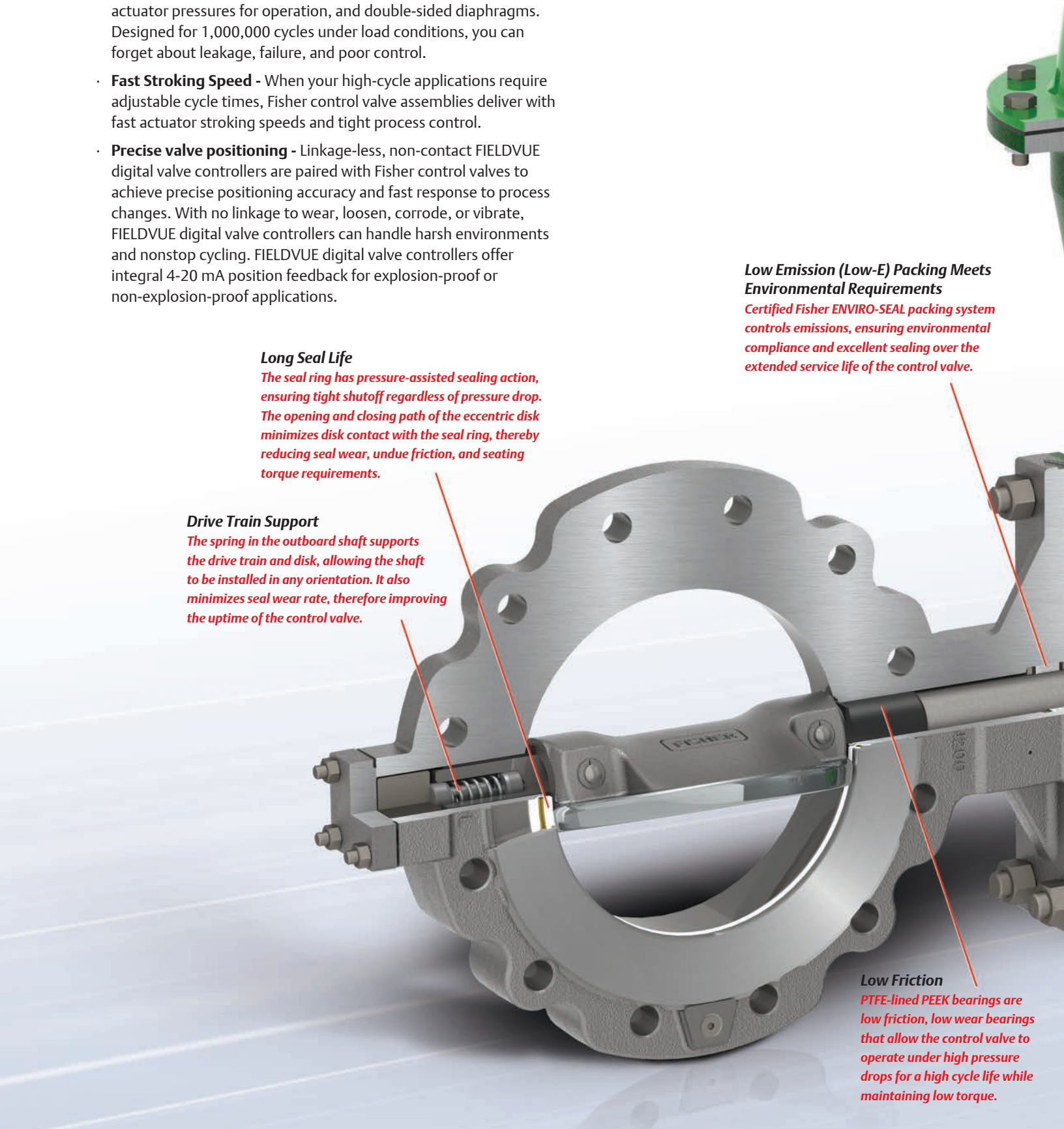
The PTFE soft seat provides Class VI shutoff and the ion-nitrided plug has a hard, wear resistance guiding surface for increased cycle life.

Fisher GX control valve, GX actuator, and DVC2000 instrument

- Licensor Approved
- Validated Through Testing to 1,500,000 Cycles
- Complete, Integrated Solution From One Supplier

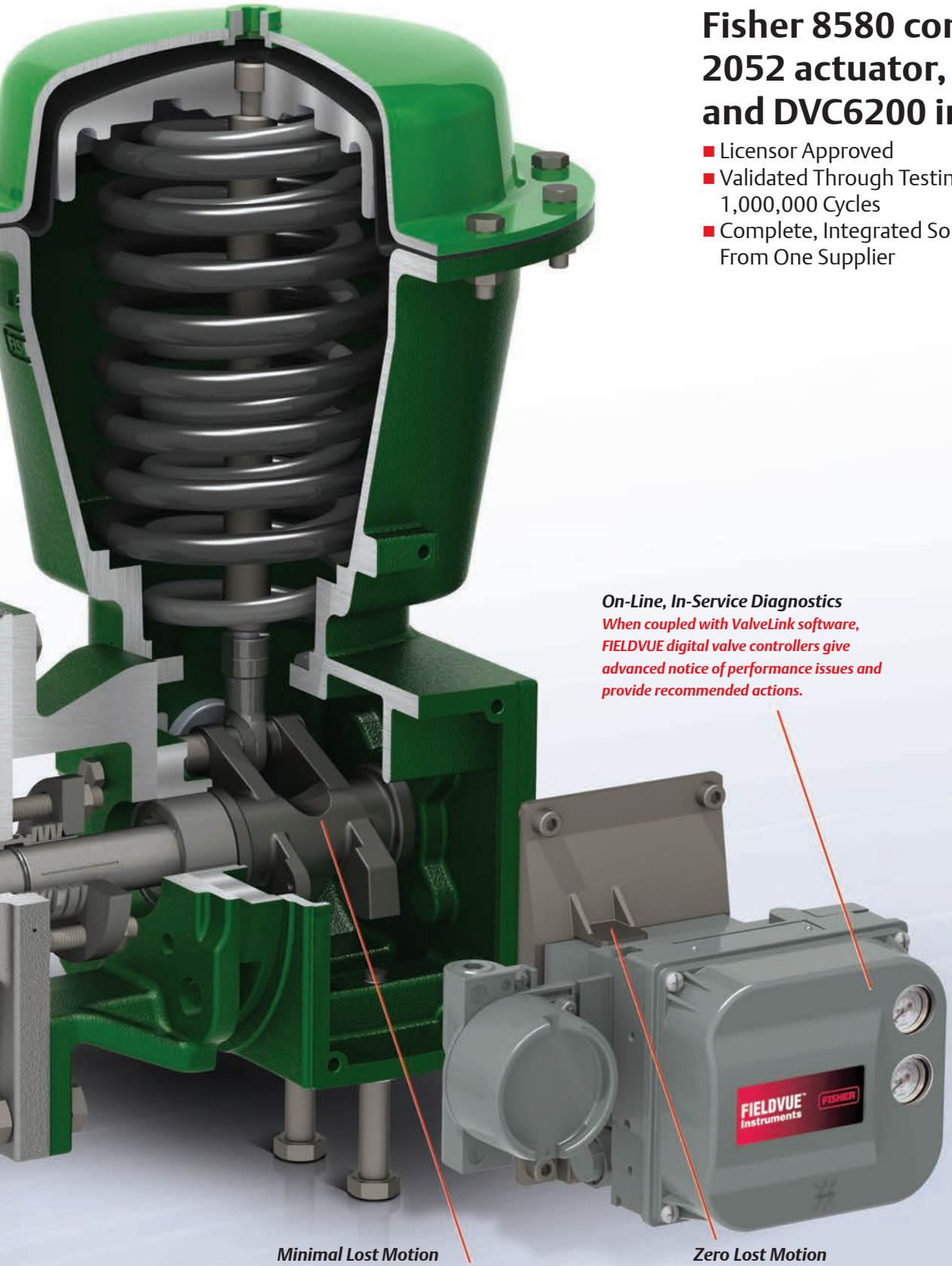
Improve Uptime with Rotary Control Valve Assemblies

- **Reliable Actuator Performance -** The 2052 spring-and-diaphragm actuator was designed for long service life under load conditions. It has no O-rings to wear, an inherent position on air failure, low actuator pressures for operation, and double-sided diaphragms. Designed for 1,000,000 cycles under load conditions, you can forget about leakage, failure, and poor control.
- **Fast Stroking Speed -** When your high-cycle applications require adjustable cycle times, Fisher control valve assemblies deliver with fast actuator stroking speeds and tight process control.
- **Precise valve positioning -** Linkage-less, non-contact FIELDVUE digital valve controllers are paired with Fisher control valves to achieve precise positioning accuracy and fast response to process changes. With no linkage to wear, loosen, corrode, or vibrate, FIELDVUE digital valve controllers can handle harsh environments and nonstop cycling. FIELDVUE digital valve controllers offer integral 4-20 mA position feedback for explosion-proof or non-explosion-proof applications.


Low Emission (Low-E) Packing Meets Environmental Requirements
Certified Fisher ENVIRO-SEAL packing system controls emissions, ensuring environmental compliance and excellent sealing over the extended service life of the control valve.
Long Seal Life
The seal ring has pressure-assisted sealing action, ensuring tight shutoff regardless of pressure drop. The opening and closing path of the eccentric disk minimizes disk contact with the seal ring, thereby reducing seal wear, undue friction, and seating torque requirements.
Drive Train Support
The spring in the outboard shaft supports the drive train and disk, allowing the shaft to be installed in any orientation. It also minimizes seal wear rate, therefore improving the uptime of the control valve.
Low Friction
PTFE-lined PEEK bearings are low friction, low wear bearings that allow the control valve to operate under high pressure drops for a high cycle life while maintaining low torque.

Fisher 8580 control valve, 2052 actuator, and DVC6200 instrument

- Licensor Approved
- Validated Through Testing to 1,000,000 Cycles
- Complete, Integrated Solution From One Supplier



On-Line, In-Service Diagnostics
When coupled with ValveLink software, FIELDVUE digital valve controllers give advanced notice of performance issues and provide recommended actions.

Minimal Lost Motion
The clamping of the lever onto the splined valve shaft, coupled with the single pivot linkage, reduces lost motion between the actuator and the control valve.

Zero Lost Motion
With no linkage to wear, loosen, corrode, or vibrate, FIELDVUE digital valve controllers can handle harsh environments and nonstop cycling. A magnet array and Hall Effect sensor are used to detect valve position.

Fisher Control Valve Lifecycle Services

The way you manage key production assets like control valves directly affects your plant's efficiency, reliability, and profitability. Emerson's Fisher Services provides trusted expertise for reliability-centered control valve maintenance and repair.

Whether you're starting or commissioning a process, scheduling diagnostics and repair, or planning a turnaround with upgrades to optimize and extend your plant's lifecycle, our network of owned and authorized service centers around the world provide effective maintenance through a network of experienced, highly skilled technicians when and where you need them.

DO YOU NEED TO...
Startup and Commission
■ Stay on schedule and within budget
■ Obtain on-site experience
■ Identify installation issues
Operate and Maintain
■ Minimize unplanned events
■ Adapt to process changes and upsets
■ Access local parts, service, and expertise
Turnaround/Outage
■ Stay within budget and on schedule
■ Ensure consistent planning and communications
■ Supplement in-house expertise
Technology Upgrade
■ Comply with environmental, safety, and health regulations
■ Minimize variability
■ Manage process changes
Optimization
■ Increase uptime and throughput
■ Improve maintenance practices
■ Adapt to change

Plant Lifecycle Events and Demands

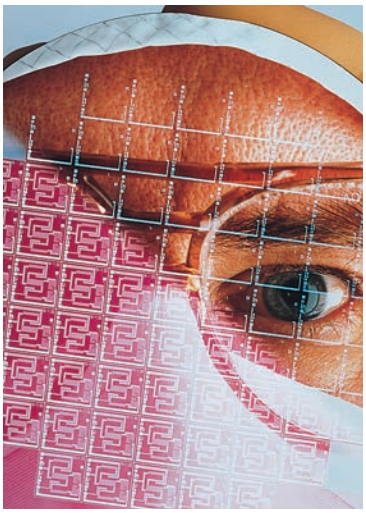
To help you maintain your plant's efficiency and reliability, Fisher Services uses only certified OEM parts and assemblies sourced through local inventories, regional parts distribution centers, and Quick Ship facilities to deliver unmatched response to customer needs.

With Emerson's Fisher Services as your trusted partner, you can realize the true potential of your Fisher and non-Fisher control valves throughout their lifecycle.

Plant Lifecycle Events	Value of Fisher Services	Solutions
Startup and Commissioning	■ Reduced startup time ■ Safe and effective startup to full capacity ■ Comprehensive as-built documentation	■ Implementation of startup and commissioning plan ■ Experienced, local Fisher certified technicians ■ Installation of "sacrificial" trim for hydro and flush ■ Skilled valve installation, calibration, and configuration ■ Provide QMS-based "as-left" documentation
Operate and Maintain	■ Reduced downtime with optimal process availability ■ Improved process control quality, on-spec product ■ Maintain regulatory compliance, safety, and certifications	■ Availability of local emergency service support ■ Certified OEM parts, repairs, and technicians ■ Quick Ship parts and assemblies ■ Implement plant survey and application review ■ Perform predictive diagnostic maintenance ■ Spare parts management services
Turnaround/Outage	■ Complete turnaround/outage on time and within budget ■ Improved reliability reduces risk and unplanned upsets ■ Increased safety during operation	■ Turnaround/outage management with six-step process ■ Experienced, local Fisher certified technicians ■ Prioritize control valve repair ■ Increase visibility to long lead-time parts ■ Provide final report and documentation ■ Perform efficient startup
Technology Upgrade	■ Reduce operational costs ■ Provide adaptability to process evolution ■ Improved maintenance efficiency and safety	■ Provide application and technology reviews ■ Implement FIELDVUE digital valve controllers and PlantWeb™ predictive intelligence ■ Upgrade control valve technology ■ Provide technology and service training
Optimization	■ Enhance process performance with reduced variability ■ Maintenance practices become more proactive ■ Improved work practices and safety ■ Focus on competencies of your business	■ Provide reliability-based maintenance programs with on-site specialists ■ Provide Fisher certified valve and instrument technicians ■ Conduct Fisher product and service training ■ Implement Emerson innovative technologies

You're Never Alone

Our extensive network of Service Center locations spans every continent. We're there for you day or night, when and where you need us, 24/7/365. To learn more, scan the QR code or visit www.Fisher.com/LifecycleServices.



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To find the Fisher sales contact in your area, scan the QR code.

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